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# Possible Typhoon-related Melioidosis Epidemic, Taiwan, 2005

**To the Editor:** Melioidosis is a severe infection caused by *Burkholderia pseudomallei*. This organism is present in tropical and subtropical regions where melioidosis is endemic. Before 1995, melioidosis was rare in Taiwan. In 2001, when the annual number of cases of melioidosis in Taiwan was determined to be 1–3 per year from 1996 to 2000, the idea was first proposed that the disease was endemic (1).

From July 21 through August 24, 2005, an unusually large number (54) of melioidosis cases occurred in Taiwan. This number exceeded the average case number of 9.4 per year from 2001 to 2004. Since this outbreak appeared to be a common-source epidemic, all persons were suspected of becoming infected from this source at the same time.

To determine this common source, we investigated the role of Typhoon Haitang, which hit Taiwan on July 18 and 19, 2005, and resulted in heavy rainfall. Because the date of this typhoon overlapped the incubation period (1–21 days in most cases) (2) and rain is a factor in outbreaks of melioidosis (3), Typhoon Haitang may have been the cause.

All 57 clinical strains of *B. pseudomallei* isolated during this outbreak were typed by pulsed-field gel electrophoresis (PFGE) DNA macrorestriction analysis (4). A higher incidence rate (8.86% per million) and clonal diversity (9 PFGE types) of *B. pseudomallei* were observed in the subtropical zone (south of 23.5°N) of Taiwan than in the temperate zone (north of 23.5°N) (0.18% per million and 2 PFGE types) (Table). Because clonal diversity in outbreaks of melioidosis is characteristic of extreme weather (5), these data support possible involvement of the typhoon in this outbreak.

Because *B. pseudomallei* can grow at a temperature as low as 4°C (6) and the possible spread of melioidosis into temperate zones has been reported (7), the epidemic distribution of *B.*

*pseudomallei* in the temperate zone of Taiwan is still not clear. Determining the role of Typhoon Haitang in exposing microbes distributed in the soil, as described by Thomas et al. (8), may provide evidence of differences in the distribution of *B. pseudomallei* in the soil of subtropical and temperate zones of Taiwan.

Most clones of *B. pseudomallei* in this study were isolated in the subtropical zone of Taiwan, but 2 clones (S2 and S7) that each caused 1 case of melioidosis were found in the temperate zone. The 2 patients infected with the S2 and S7 clones lived  $\approx 200$  km north of the boundary between the subtropical and temperate zones and had not crossed this boundary for  $\geq 3$  years. Although the incubation period for *B. pseudomallei* may be as long as 62 years (9), and the presence of this organism in the temperate zone before Typhoon Haitang cannot be excluded, we believe that these 2 patients are newly infected cases in the temperate zone.

The 2 predominant clones in this outbreak, S1 and S3a, caused 30 and 10 cases of melioidosis, respectively. Since the appearance of predominant clones, a case-cluster of melioidosis been regarded as an indicator of contamination of an environmental source (5). This clustering suggests contamination of soil in the subtropical zone of Taiwan with the S1 and S3a clones.

Patients in this outbreak had severe symptoms of melioidosis, including fever (38/54), cough (16/54), pneumonia (12/54), septic shock (9/54), shortness of breath (4/54), and chest pain (2/54). Eleven of the 54 patients died. Because few patients had skin injuries and most (32/54) had a short incubation period of 1–9 days, inhalation may have been the route of transmission. Increased inhalation of *B. pseudomallei* has been reported in cases of melioidosis during heavy monsoonal rain and wind (3).

In conclusion, Typhoon Haitang likely had a role in an outbreak of melioidosis in the subtropical zone of Taiwan that showed high incidence rates and clonal diversity of isolates of *B. pseudomallei*. Our findings showed differences in distribution of *B. pseudomallei* in the soil of subtropical and temperate zones of Taiwan. *B. pseudomallei* clones found only in the temperate zone warrant further study to help prevent their spread. Some clones predominant in the subtropical zone may be suitable for vaccine development.

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## References

1. Hsueh PR, Teng LJ, Lee LN, Yu CJ, Yang PC, Ho SW. Melioidosis: an emerging infection in Taiwan? *Emerg Infect Dis.* 2001;7:428–33. [Medline](#)
2. Currie BJ, Fisher DA, Howard DM, Burrow JN, Selvanayagam S, Snelling PL. The epidemiology of melioidosis in Australia and Papua New Guinea. *Acta Trop.* 2000;74:121–7. [Medline](#)
3. Currie BJ, Jacups SP. Intensity of rainfall and severity of melioidosis, Australia. *Emerg Infect Dis.* 2003;9:1538–42. [Medline](#)
4. Popovic T, Schmink S, Rosenstein NA, Ajello GW, Reeves MW, Plikaytis B. Evaluation of pulsed-field gel electrophoresis in epidemiological investigation of meningococcal disease outbreak caused by *Neisseria meningitidis* serogroup C. *J Clin Microbiol.* 2001;39:75–85. [Medline](#)
5. Cheng AC, Jacups SP, Gal D, Mayo M, Currie BJ. Extreme weather events and environmental contamination are associated with case-clusters of melioidosis in the Northern Territory of Australia. *Int J Epidemiol.* 2006;35:323–9. [Medline](#)
6. Chen YS, Chen SC, Kao CM, Chen YL. Effects of soil pH, temperature and water content on the growth of *Burkholderia pseudomallei*. *Folia Microbiol (Praha).* 2003;48:253–6. [Medline](#)
7. Perret JL. Melioidosis: a tropical time bomb that is spreading. *Med Trop (Mars).* 1997;57:195–201. [Medline](#)
8. Thomas AD, Forbes Faulkner J, Parker M. Isolation of *Pseudomonas pseudomallei* from clay layers at defined depths. *Am J Epidemiol.* 1979;110:515–21. [Medline](#)
9. Athan E, Allworth AM, Engler C, Bastian I, Cheng AC. Melioidosis in tsunami survivors. *Emerg Infect Dis.* 2005;11:1638–9. [Medline](#)

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Table. PFGE patterns of clinical isolates of *Burkholderia pseudomallei* obtained before and after Typhoon Haitang, Taiwan, 2005\*

PFGE types	No. clinical isolates					
	Before (Jan–Jun)			After (Jul–Sep)		
	Subtropical zone, no.	Temperate zone, no.	Total, no. (%)	Subtropical zone, no.	Temperate zone, no.	Total, no. (%)
S1	0	0	0	31	0	31 (57.4)
S1a	0	0	0	1	0	1 (1.9)
S2	0	0	0	0	1	1 (1.9)
S3	0	0	0	3	1	4 (7.4)
S3a	2	0	2 (66.6)	10	0	10 (18.5)
S3b	0	0	0	2	0	2 (3.7)
S3c	0	0	0	2	0	2 (3.7)
S4	0	0	0	1	0	1 (1.9)
S5	1	0	1 (33.3)	0	0	0
S6	0	0	0	1	0	1 (1.9)
S7	0	0	0	0	1	1 (1.9)
Total	3	0	3 (100)	51	3	54 (100)
Incidence rate†	0.52	0	0.13‡	8.86§	0.18§	2.38‡

\*Typhoon Haitang hit Taiwan on July 18, 2005. Logistic regression analyses evaluating the associations were conducted with SAS software version 6.12 (SAS Institute, Cary, NC, USA). PFGE, pulsed-field gel electrophoresis.

†Per million population. At the end of June 2005, the population of subtropical counties was 5,753,647, and the population of temperate zone counties was 16,936,127. In 2005, the population at risk for melioidosis in Taiwan was 22,689,774. Data obtained from the Department of Taiwan Internal Affairs.

‡Odds ratio (OR) 17.99, 95% confidence interval [CI] 5.63–57.54,  $p = 0.0001$ .

§OR 0.019, 95% CI 0.006–0.060,  $p = 0.0001$ .